



## Drinking water: Risks, solutions, and monitoring. Case: Nørrebro

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# Abstract proceedings

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## Drinking water: Risks, solutions, and monitoring. Case: Nørrebro.

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### Abstract

The drinking water supply is extremely decentralized in Denmark with approximately 2600 waterworks, exclusively groundwater based and without disinfection. Ten years ago the Danish Environmental Protection Agency (EPA) and the Danish Water and Waste Water Association (DANVA) conducted questionnaires addressing the environmental centers, municipalities and waterworks to collect information on microbial drinking water contaminations. The project (Engelsborg et al., 2009) aimed at elucidating factors influencing and affecting drinking water contaminations.

The data included waterworks and distribution systems and were based on 3,123 measures of microbiological parameters. In the investigated period January 1<sup>st</sup> 2000 - December 31<sup>st</sup> 2002, at least 205 microbial incidents in 185 different water supplies, and 50 boiling orders were registered. Microbial contaminations increased during autumn, following the increase in precipitation where the larger water volumes increase the risk for intrusion of surface water into the water supply. 48% of the microbial contaminations were only detected at the waterworks and 30% only in the distribution systems. More serious contaminations (*i.e.* levels which should lead to boiling order) were detected at waterworks than in distribution networks. The frequency of microbial contaminations was relatively high at the very small water supplies (<10,000 m<sup>3</sup>/yr), since 23% of the detected contaminations was related to these water supplies. 94% of all serious contaminations were detected in small water supplies (< 350,000 m<sup>3</sup>/yr, ~4,560 users) which constituted 94% of the waterworks in Denmark. However, this group only abstracts approximately 36% of the total abstracted volume in Denmark, indicating a relatively larger risk for serious contamination for smaller water supplies than for larger ones. In distribution systems more microbial contaminations were detected related to larger water supplies with a more frequent control than in smaller ones, and it is assumed that the detection of contaminations in distributions systems probably is proportional to the frequency of sampling. The boiling orders lasted more than 100 days in 23% of the cases, and for 23% of the cases with boiling order, it took more than 1 month before the boiling order was issued.

Data from the Enteropathogenic Register with the address of diarrhea-patients, were related by GIS-tools to the geographical location of the contaminated water supply area. Diarrhea-frequency was higher in contaminated water supply area compared to the rest of the municipality in more than half of the 35 investigated cases – by detailed analysis in an even larger fraction. There was also a tendency for higher number of gastro-intestinal disease for consumers living in area with a low degree of urbanization (rural) than in large cities.

During the last years Embedslægerne has followed up on this work with annual reports on drinking water contaminations confirming that the frequency of contaminations is more or less unaltered.

Increased control and monitoring may be ways to prevent the microbial contaminations – and DDS (water safety plans) and increased on-line monitoring (Corfitzen & Albrechtsen, 2011) have been initiated at many water utilities, but so far the full advantages of these initiatives remain to be harvested. Unfortunately a number of major contaminations have been registered, at e.g. Køge, Tune, Aarhus, and Copenhagen and lately Kalundborg - in some cases even with substantial outbreaks. This probably reflects an increased awareness of the water quality and the monitoring data.

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